Germination of *Argania spinosa*: Overcoming genetic and physical barriers of Morocco's infamous seed

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Introduction

The Argan Tree

Pic. 1: Goats climbing an argan tree to eat its fruit.

Pic. 2: A map of southwest Morocco showing the argan forests

- *Argania spinose* (argan tree) is one of the oldest species of trees on the planet today, with individual trees living hundreds of years[1].
- The argan tree is secluded to growing in the southwest region of Morocco at the edge of the Sahara Desert[3].
- The tree now faces new challenges in living and reproducing due to a rise in goat domestication and popularity of argan oil in the cosmetic industry[1]. The sudden global popularity has cause the price of the oil and seeds to skyrocket.
- The oil provides many Moroccans with work opportunities and lies at the center of their economy[2].
- Moroccans now face a challenge to balance protecting their iconic trees and profiting from the cosmetic industry.

Research Questions

- But what physical and chemical traits does this tree have that enables successful germination in such a dry climate?
- Through working with the National Institute for Agricultural Research- Agadir in Morocco, the answer to this question, and to other similar questions, were explored.
  - Which temperature will argan seeds germinate better in?
  - Which tree will have better overall germination? What are possible reasons for this?
  - If there any correlation between seed size and germination success?
  - What are some external factors that affect germination speed? And how?

Experimental Procedure

Gathering seeds
Seeds were hand gathered from a controlled research farm

Seed Preparation
Seeds were measured, sorted and sanitized

Germination
Seeds were monitored for signs of germination or infection

Oil Extraction
Oil was extracted from different seeds of the same trees using Hexane for a content analysis.

Data / Observations

Figure 1 shows germinating seeds infected by an unidentified fungus

Figure 2 shows seeds infected by an unidentified parasite

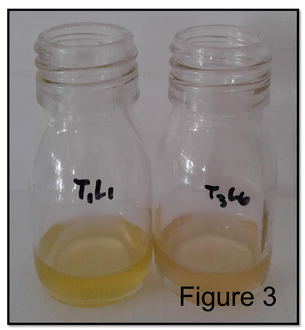

Figure 3 shows a color comparison of oil between the two argan trees that were tested. T_1L_1 oil shows a healthier yellow vs the T_3L_6 shows a less healthy almost brown color.

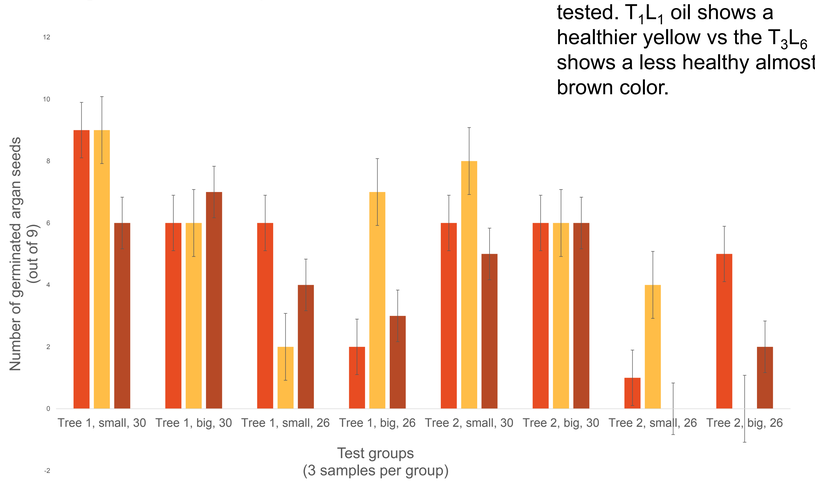

Figure 4 shows a graphical comparison of all the germinating seeds in their different classifications and environmental treatments

Results

- The experiment did not go as expected. Every time the seeds were checked for germination, there were more infected seeds. When infected seeds were identified, all the seeds in that petri dish were sanitized in a bleach solution and placed in a new petri dish. Figures 1 and 2 show the infections that kept attacking the seeds.
- We got some indication about what was in each oil by the color difference between the trees (fig. 3). The oil form T_1L_1 indicates a healthier protein and fat content than the oil from T_3L_6 (fig. 3). There was no difference between the infection rate between the two trees. Both trees had infected seeds.
- Figure 4 shows that there is no significant difference between the way seeds germinated between the two trees, temperatures or size. The genetic tests that were supposed to be done on the oil were not done because we ran out of time and resources.
- An unexpected result was learning about how Moroccans do research. The cross-cultural comparisons are present in the differences Moroccans and Americans conduct scientific research. The primary difference was Moroccan labs do not have many one time use tools. They have many reusable and recycled tools and spend more of their time washing and sanitizing. American labs have many more one time use tools because they have more money and less time.

Conclusion

- Main threats to argan germination are fungi and parasites.
- Further research that would be helpful to the preferred temperature of germination would be to compare 30, 35 and 40°C germination rates. Future research would also need to be done to do a more significant genetic analysis.
- Further research should be done on identifying these parasites and fungi to increase the integrity of argan conservation efforts.
- While researching abroad, it is important that the scientists are aware of different cultures and to be respectful of differences in research because of that.

Resources

- 1. N. A. Aabd, F. Msanda, A. E. Mousadik. *Evaluation of variability in argan oil content through different environments and preselection of elite genotypes.* International Journal of Plant Breeding, Volume 195: number 2, 157-167. June 20, 2013.
- 2. Anonymous. Interview at Ait Matine Argan Co-op. June 1, 2017.
- 3. F. Alba-Sanchez, J. A. Lopez-Saez, D. Mieto-Lugilde, J. C. Svenning. *Long-term climate forcings to assess vulnerability in North Africa dry Argan woodlands.* Applied Vegetation Science, Volume 18: issue 2, 283-296. April, 2015.

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